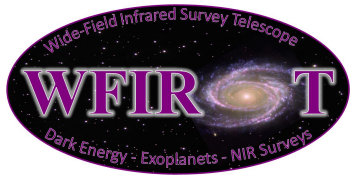


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# Rationale for a DRM Close to Astro2010

Neil Gehrels, WFIRST Project Scientist  
March 11, 2011

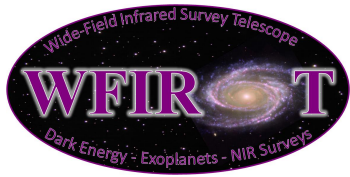


# Rationale for WFIRST Approach



## Dark Energy

- Three techniques to get FoM  $\sim 1000$  & provide cross checks
- SN measurement from space for efficient, clean IR coverage and systematics control
- BAO and WL with sky coverage of many thousand sq deg
- Systematic control:
  - BAO measurement with fixed prism (single order, high efficiency)
  - $R \sim 200$  in BAO prism to split the O III interloper doublet but not lose sensitivity by overly resolving lines
  - WL shape measurement with pixel scale  $< 0.2''/\text{p}$
  - Filter wheel for SN spectroscopy and high quality WL photo-z's
- 1.5m mirror for deep, fast observations of SN, WL and BAO
- $R \sim 100$  spectroscopy for SNe
- WL shape measurement in the NIR where galaxies shapes are smooth



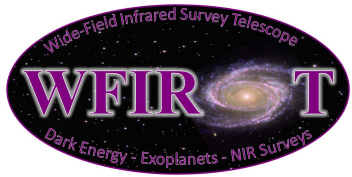
# Rationale for WFIRST Approach



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## Microlensing

- Different and complementary exoplanet parameter space than transit and radial velocity techniques
- Unique free floating planet sensitivity
- Observations of galactic bulge with high star density
- Observing campaigns of  $>1$  month duration to reduce light curve edge effects
- NIR observations to observe extincted regions
- Large FoV (large imager array) to cover adequate stars
- Pixel scale of  $< 0.25''$  to avoid source confusion
- L2 orbit (not LEO) for uninterrupted observations to find magnification transients



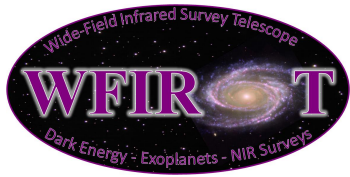
# Rationale for WFIRST Approach

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## Sky Surveys

- Coverage of good fraction of sky in NIR to AB~25
- Filter wheel for multiband photometry
- Galactic plane survey
- Photo-z survey with ~ billion galaxies
- 3D spectroscopic survey with ~100 million galaxies

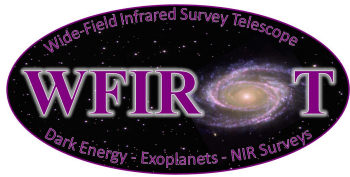


# WFIRST Scenarios



3 possible scenarios for WFIRST and Euclid

- Euclid is not selected:
  - Only mission is WFIRST. Community will desire full capability, even if launch is later than 2021
- Euclid is selected and ESA wants to join with NASA
  - NASA should come to the table with a fully capable WFIRST DRM
  - Merged mission would combine requirements from both missions

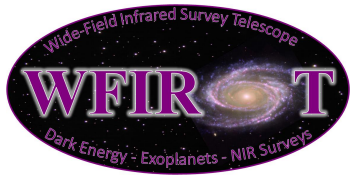


# WFIRST Scenarios

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- Euclid is selected and ESA does not want to join with NASA
  - Unique aspects of WFIRST are key to its survival
  - Microlensing & SNe are unique and must be kept
  - WL: Euclid will make an excellent WL measurement. However, WFIRST WL shape measurement in NIR is unique. FOM will not be larger than Euclid, but NIR measurement would provide a cross-check with different systematics ?????
  - WFIRST BAO measurement has higher nP than Euclid by factor 3. Prism provides clean, efficient spectroscopy.



# Conclusions



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- In scenarios with no Euclid or merged mission, the best DRM configuration is close to Astro2010
  - In scenario with separate Euclid & WFIRST, it might make sense to delete WL from WFIRST. In this case the ISWG configuration could be considered. Alternatively, it might still make sense to keep the NIR WL shape measurement on WFIRST
  - In all configurations, some changes in JDEM-Omega configuration could be considered to reduce cost.